

ENERGY
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Where Will the Gas Come From?

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Where Will the Gas Come From?

I. Executive Summary.

A. Urgent need to expand energy supplies available to the U.S. market.

Over the past 5 years, natural gas prices have tripled, increasing the cost for natural gas and electricity by more than \$ 125 billion per year. Further, natural gas supply deficits have forced many U.S. companies to shut down U.S. manufacturing facilities or transfer operations overseas, costing thousands of Americans their jobs.

In the near future, however, the threat to the U.S. economy from insufficient supplies of natural gas is likely to increase several fold – with the potential to cause lasting harm to the U.S. economy.

There is a critical need, therefore, to carefully assess future U.S. natural gas supply requirements and the available options for meeting future U.S. needs.

This paper examines these issues in depth. The paper concludes that the U.S. currently faces a huge potential natural gas supply deficit that could seriously impede the growth of the U.S. economy for many years – and potentially sound a death knell for a number of core manufacturing industries.

There is an attractive strategy available, however, that can ensure that adequate supplies of affordable natural gas and electricity are available to meet U.S. needs, especially during the critical period of the next 10 to 15 years when other options are limited. This strategy also can: (i) add tens of thousands of new U.S. jobs; (ii) strengthen significantly the ability of U.S. manufacturers and farmers to compete in global markets; and (iii) reduce U.S. dependence upon imported fuels.

To accomplish these objectives requires focusing on four specific initiatives – all of which rely upon expanded use of domestic resources to provide the additional energy required for the U.S. economy to continue to grow at a normal rate:

1. An urgent, “highest priority effort possible” effort to construct coal gasification facilities in order to provide a source of fuel for existing gas-fired combined cycle generating units (many of which are currently underutilized) and reduce power sector consumption of natural gas;
2. Construction of coal gasification facilities at major industrial facilities that currently burn natural gas;
3. Intensified efforts to maximize exploration and development of new gas fields; and
4. Accelerated construction of new Advanced Pulverized Coal plants, over and above the normal organic growth in coal-fired generating capacity, to further reduce the use of

natural gas to generate electricity.

One of the primary goals of this program is to minimize further growth in the use of natural gas to generate electricity in order to preserve natural gas for other higher priority uses.

To accomplish this goal requires adding enough new coal gasification capability and new Advanced Pulverized Coal units to displace at least 2.0 to 2.75 TCf of natural gas by 2015 and to displace an additional 2.0 TCf by 2020. This would require adding approximately 35,000 – 50,000 MW of gasification capability and/or new Advanced Pulverized Coal capability by 2015 and adding an additional 35,000 MW by 2020.

Adding this capacity would expand coal use by approximately 115 to 160 million tons per year by 2015 and by a total of 230 to 275 million tons by 2020. This represents an increase of 9.8 % to 14.0 % by 2015 over expected total U.S. consumption in 2005 of 1.155 billion tons and an increase of an additional 9.8 % by 2020 beyond the normal organic growth that is expected to occur during this period.

The first two prongs of this program in particular -- i.e., use of coal gasification to provide an alternative gas supply for existing combined cycle units and existing industrial users of natural gas -- are the "low hanging fruit."

Rapid deployment of coal gasification offers the best opportunity we have as a country to dramatically reduce the intense pressure that otherwise is certain to exist over the next 10 to 15 years on available U.S. supplies of natural gas – potentially resulting in periodic shortages of both natural gas and electricity and sending prices for natural gas and electricity through the roof.

Pursuing this program is the single most powerful step that can be taken to keep natural gas and electricity prices from exploding and to provide U.S. manufacturers and farmers (who depend upon the availability of reasonably-priced fertilizer made from natural gas) with an opportunity to continue to compete successfully in global markets.

The energy supplies provided through this program can be developed with certainty, on a cost effective basis and within a reasonably short time frame.

Developing these domestic resources, coupled with aggressive efforts to promote conservation and speed deployment of renewable energy, is the only realistic solution available during the next 10 to 15 years to prevent natural gas and electricity costs from spiraling out of control.

It is also the best available strategy to break the emerging link between U.S. natural gas and electricity prices and the price of oil.

At the same time, it provides our last, best hope of preserving a substantial core manufacturing sector as part of the U.S. economy (much of which otherwise is at risk of being forced to leave the U.S. market in the near future) and avoiding significant further deterioration in the U.S. trade deficit (which currently is at an all-time high).

B. Absent this program the U.S. is virtually certain to face a massive natural gas supply gap.

The urgency of undertaking a program of this nature couldn't be more clear-cut. In its most recent annual forecast, the U.S. Energy Information Administration (EIA) estimates that to sustain normal economic growth U.S. natural gas supplies must be expanded by at least 4.59 TCf/year by 2015. See Annual Energy Outlook 2005 (AEO 2005).

This is more in BTU equivalent terms than total current U.S. oil imports from the Middle East. EIA estimates that an even larger increase, potentially of at least 6.0 TCf, is needed by 2020.

As staggering as these figures may seem, however, even larger increases in natural gas supplies are likely to be required in many years, due to a wide range of factors.

The potential shortfall in U.S. natural gas supplies will be significantly greater, for example, in any year in which: (i) U.S. natural gas production falls short of expected levels; (ii) imports from Canada fall more rapidly than expected; (iii) U.S. electricity demand grows more rapidly than expected; (iv) winters are colder-than-normal; (v) summers are hotter-than-normal summers; (vi) hydro availability is below normal (especially in the Pacific Northwest); (vii) nuclear plant availability is poorer than normal; (viii) coal or nuclear plant retirements exceed expected levels; or (ix) if the proposed Alaskan pipeline project is not built or the start-up date is delayed beyond 2016 (i.e., the start-up date assumed by EIA in its most recent forecasts of U.S. supply and demand).

One or more of these contingencies is virtually certain to occur in at least some future years.

It is quite possible, therefore, that in some years as much as 10 TCf or more of additional natural gas supplies will be needed to meet the needs of the U.S. market. This begins to approach total U.S. energy consumption not too many decades ago.

Even using EIA's far lower estimates of total U.S. requirements, however, there is a consensus that, due to the aging of most major natural gas fields in the U.S. and Canada and increased domestic needs in Canada, the required increase in U.S. natural gas supplies **cannot be obtained from North American sources of supply.**

This leaves an unprecedented potential gap in expected U.S. energy supplies that, absent immediate action to develop alternative sources of supply, is likely to have a devastating impact on the manufacturing sector (which depends on natural gas for feedstock and fuel) and on the nation's electricity supply (since the U.S. is currently dependent upon expanded use of gas-fired electric generators to meet its incremental electricity requirements in most Regions of the country).

The overall impact on the U.S. economy if this potential deficit is not remedied could be far more severe than is currently recognized. Growth in electricity supplies could be largely brought to a halt. Prices for electricity and natural gas could escalate sharply, draining needed purchasing power from the U.S. economy. Further, many U.S. manufacturers, in industries ranging from plastics to pharmaceuticals to steel, could find it difficult to continue operating in the U.S.

C. Largely by default, the U.S. is currently relying upon a largely unexamined, untested strategy of hoping to be able to massively increase imports of Liquefied Natural Gas (LNG) to meet most of the incremental natural gas requirements of the U.S. economy.

Even though the existence of this potential natural gas supply gap has become well known in recent years, no effort is currently being made at the federal level to develop a well thought-out, comprehensive strategy to ensure the continued availability of adequate supplies of affordable natural gas and electricity in the U.S market.

Instead, by default, the U.S. is currently depending on two uncertain sources of supply to satisfy virtually all of its incremental natural gas requirements for the next 20 to 25 years:

- Completion of the proposed Alaskan pipeline to bring existing supplies of natural gas from Alaska into the lower 48 states; and
- The hope that the U.S. will be able to massively increase imports of Liquefied Natural Gas (LNG) (which currently account for less than 3 % of total U. S. natural gas supplies) from projects yet-to-built in the Middle East, West Africa and other distant lands.

The proposed Alaskan pipeline still is in the planning stage. EIA estimates, however, that it potentially can be completed by 2016 and achieve full capacity by 2017.

Construction of most of the proposed LNG projects expected to supply incremental U.S. needs, however -- the primary expected source of supply to meet the future energy needs of the U.S. economy -- has not yet even begun.

Many of these LNG projects will not be under the direct control of American companies. Most have not yet obtained financing or even signed definitive commercial agreements.

Given the scope and complexity of these LNG projects, which are expected to often cost as much as \$ 5 to 9 billion per project, it is unrealistic to assume that all or most of these projects will be completed on time. Instead, completion of many of these projects is likely to be delayed -- often by several years. Some -- perhaps many -- may never be built.

Further, even if a number of these proposed new mega-projects are completed, other countries may outbid the U.S. for all or most of the available output from some or all of the projects that come on line during the next 5 to 10 years.

Notwithstanding these obvious risk factors, the feasibility and potential costs, benefits and risks of a strategy for meeting future U.S. energy needs that depends heavily on being able to massively increase imports of LNG have never been carefully examined by any federal or state agency and has not been the subject of extended discussion or debate at the federal level.

Instead, a major shift in U.S. energy policy that is likely to have major impacts on the U.S. economy

for decades and could cost hundreds of thousands of Americans their jobs has occurred largely in a vacuum.

It is clear, however, that a U.S. energy strategy that depends upon being able to massively increase imports of LNG in a timely manner and at affordable prices has a significant risk of failing.

If it does, the potential adverse consequences for the U.S. economy could be devastating.

D. Relying exclusively on LNG, in conjunction with completion of the proposed Alaskan pipeline, to meet expected U.S. needs potentially is a very high risk, high cost strategy that is unlikely to satisfy total U.S. natural gas requirements in a timely manner.

A heavily LNG-dependent strategy for meeting future U.S. energy needs presents at least four fundamental risks:

- The LNG supplies available to the U.S. market over the next 10 to 15 years are virtually certain to fall below the levels currently being assumed in EIA's forecasts. While much of the discussion to date in the U.S. regarding LNG has focused largely on the siting of new LNG delivery terminals, there is a substantial risk that many of the proposed new multi-billion dollar LNG production and liquefaction projects needed to supply these terminals, such as the projects in Nigeria or the projects in Qatar that potentially could provide supplies to the U.S. market (which are among the last in the queue in that country) will be delayed for several years or potentially never even completed.

Further, even if the 1st round of proposed new LNG projects is completed, it is no longer clear that the potential 2nd round of major LNG projects needed to satisfy U.S. needs between 2010 and 2020 will even be initiated. Major producers such as Qatar, for example (which recently announced a moratorium on any new projects) may choose to defer development of additional LNG projects for several decades (Qatar has suggested a 100-year time frame for development). Further, even if countries with stranded gas reserves decide to undertake additional development, priority may be given to Gas-to-Liquids (G-T-L) projects, which have shorter lead times and are urgently needed to help satisfy the acute need for diesel fuel in the global oil market. Finally, in a global LNG market that may be chronically undersupplied for many years, even if a limited number of 2nd round LNG projects are built, the U.S. may be outbid for the output from many of these projects by China, India, Great Britain, France, Spain or any of a host of other countries competing for limited supplies of LNG in an undersupplied global market.

If any one of these contingencies occurs, the LNG supplies available to the U.S. market will fall far short of required levels, potentially leading to severe price spikes and shortages in both the natural gas and electricity markets in the U.S.

To date, however, no effort has been made to develop a fall-back strategy to deal with these risks, even though the potential adverse impact on the U.S. economy could be severe.

- While LNG initially was held out as a potential low cost fuel that would help to constrain natural gas prices in the U.S., in the current, supply-constrained global energy market, there is little reason to continue to expect LNG to remain a low cost alternative.

At best, future LNG pricing is uncertain.

Further, in a global market in which oil supplies are far tighter than was expected just two years ago or even at the beginning of this year and LNG is fungible with oil for a number of important uses, LNG pricing already increasingly is being linked to the price of oil. Over time, a heavily LNG-dependent strategy almost certainly will increase the likelihood that prices for all three forms of major energy used in the U.S. (i.e., oil, natural, gas and electricity) will be linked directly to the global price of oil -- with severe potential adverse repercussions for the U.S. economy.

- A heavily LNG-dependent strategy virtually guarantees that U.S. manufacturers will be at a competitive disadvantage in attempting to compete in global markets.

Since the cost to ship LNG to the U.S. is higher than for almost any other market (due to greater shipping distances), depending upon LNG has the potential to lock U.S. companies into paying higher prices for natural gas and electricity than competitors anywhere else in the world. A heavily LNG-dependent strategy could virtually guarantee, therefore, that U.S. companies will be at a significant disadvantage in competing in global markets.

- Just as a significantly, even if a heavily LNG-dependent strategy is successful in obtaining targeted levels of supply (which is extremely doubtful), it would massively increase U.S. dependence upon imported fuels and have a major adverse impact on the U.S. balance of payments deficit.

This in turn inevitably would lead to a huge further drain on the U.S. balance of payments deficit at a time when there is critical need to reduce the size of the U.S. trade deficit.

The potential adverse impact on the U.S. balance of payments deficit could be devastating. ***If recent estimates by EIA prove to be accurate, for example, by 2025 the amount of LNG imported into the U.S. could be 1.5 X the current level of oil imports from the Middle East.*** Even if the U.S. succeeds in developing a program to reduce dependence upon imported oil, therefore, if the U.S. adopts a heavily LNG-dependent strategy for meeting its natural gas requirements, dependence upon oil imports could simply be replaced with dependence upon another imported fuel (i.e., LNG) that may well be priced on essentially the same terms.

- Finally, since a lead time of at least 5 to 7 years is required to significantly expand LNG supplies, and maintaining "spare" LNG production capacity is prohibitively

expensive, a heavily LNG-dependent strategy for satisfying U.S. natural gas requirements, without developing other new sources of supply, would leave the U.S. vulnerable to severe natural gas and electricity price spikes and supply shortages in any year in which demand for natural gas significantly exceeds expected levels.

Because of the long lead-time required to develop new LNG projects and the likelihood that global demand for LNG will significantly exceed global supplies for many years, a strategy that relies almost exclusively on massive imports of LNG to meet incremental U.S. needs for natural gas, supplemented only by gas brought down from Alaska once the proposed Alaskan pipeline is completed, is ill-suited for dealing with contingencies that could cause U.S. natural gas consumption to significantly exceed expected levels in future years (e.g., an increase in demand for natural gas due to a colder-than-normal winters or hotter-than-normal summers or a temporary or permanent shutdown of a significant number of nuclear plants).

This potentially could result in natural gas supply shortfalls that could persist for many years -- since there is no guarantee that there will be any excess output available on the global LNG market in the near-term to make up for potential supply deficits in the U.S. market and the time frame required to add new LNG production capability is daunting -- especially since the decision on whether to allow construction of new LNG supply projects is not under direct U.S. control.

In the interim, the U.S. would be left with no effective means of responding to natural gas supply shortages, even though such shortages could have a crippling impact on the U.S. economy.

In effect, therefore, by becoming dependent upon a source of supply that can not be expanded within a short time frame and is not under direct U.S. control, the U.S. economy would become vulnerable to energy shortages that in many respects could be similar to the supply disruptions the U.S. has been attempting to avoid in the oil sector for more than 50 years through its policies in the Middle East and attempts to avoid in the power sector by requiring electric utilities to maintain significant amounts of reserve generating capacity (which will be of little value if there is not sufficient fuel available to operate existing gas-fired generating units).

E. The potential benefits of the program proposed in this paper are compelling.

By contrast, the potential benefits of the program described in this paper are clear-cut.

By relying upon abundant domestic sources of energy under direct U.S. control, the proposed program, once fully implemented, can eliminate almost entirely the risk of future natural gas or electricity shortages in the U.S. market.

In addition, however, there are numerous other benefits. These include:

- Creation of a large number of new U.S. jobs -- both to build the required gasification facilities and to continue to produce domestic fuels on an ongoing basis.

- Providing a realistic strategy, using domestic fuels, to avoid what otherwise are likely to be prohibitive further increases in U.S. natural gas and electricity costs that could cripple the U.S. economy.
- Putting in place a realistic strategy for retaining hundreds of thousands of U.S. jobs in the numerous core manufacturing industries that depend upon access to reasonably-priced natural gas for use as feedstock and/or fuel.
- Avoiding what otherwise is likely to be a huge drain on the U.S. balance of payments.
- Finally, major national security benefits, achieved by obtaining U.S. energy supplies from a diverse range of projects under direct American control here at home rather than from a small number of huge mega-projects located thousands of miles from the U.S. that could become subject to control by other countries at any time in a global market in which international competition for energy resources already is becoming intense. (The loss of supply from a major LNG project could occur due to any of a variety of factors, including: (i) other countries outbidding the U.S. for available supplies; (ii) a change in control of government in the host country (either due to an election or a coup) that results in changes geo-political alliances; (iii) the use of military force against the host country; or (iv) an accident or other supply disruption that shuts down the production facility on a temporary or permanent basis (i.e., in the worst case scenario, a terrorist attack that destroys one or more major liquefaction plants in the Middle East or West Africa).)

F. Need for immediate action.

The choice between alternative strategies available to the U.S. for meeting its future natural gas and electricity requirements has far-reaching implications for the health of the U.S. economy, the U.S. trade deficit and the ability of U.S. companies to continue to compete successfully in global markets.

Remarkably, however, despite the critical importance of reliable and affordable energy supplies to the continued growth of the U.S. economy and the uncertain status of many proposed new LNG projects in distant lands, no Federal or State Agency has yet undertaken a careful, systematic evaluation of: (i) the feasibility, costs, benefits and risks of a strategy of relying on efforts to massively increase imports of LNG; or (ii) the costs and benefits of potential alternative strategies such as the strategy proposed in this paper.

Instead, with little or no public discussion or debate, the U.S. is currently effectively betting its economic future on the ability to massively increase imports of LNG from projects that have not yet been built and that, even if they ultimately are completed, may be delayed for many years and/or sell their output to other countries in an increasingly competitive world market.

As a practical matter, therefore, a decision of profound importance is being made without any intelligent assessment of the potential feasibility, costs, risks and benefits of available options.

The choices before us, however, are stark and the stakes for the U.S economy couldn't be much higher – potentially for many decades. It is essential, therefore, that we attempt to make a more informed decision regarding the strategy we intend to pursue at the earliest possible date.

Over the past several years, increased costs for natural gas and inadequate supplies already have resulted in several hundred billion dollars in higher-than-expected natural gas and electricity costs in the U.S. market – slowing down the growth of the U.S. economy and costing thousands of Americans their jobs.

The damage that has occurred to date, however, could prove to be just the “tip of the iceberg” unless concerted action is taken at the national level this year to put in place a cost-effective, low risk strategy to meet our incremental needs for electricity and natural gas during the period between now and 2020.

II. Major Choice-Point for the U.S. Economy.

A. Only Two Major Options Available to Provide the Bulk of Incremental U.S. Energy Supplies Over the Next 10 to 15 Years.

America is at a critical choice point, when decisions of far-reaching importance must be made regarding the core strategy for meeting this country's incremental natural gas and electricity requirements over the next 10 to 15 years.

The resolution of this issue will have profound impacts on the health of the U.S. economy, the U.S. trade deficit and the ability of U.S. companies to compete in global markets for many years.

While efforts to increase conservation and expand use of renewable energy can play a major role in meeting future U.S. energy needs, between now and 2015 or 2020 only two major options are available to meet the bulk of America's incremental needs for electricity and natural gas:

- An effort to massively increase imports of Liquefied Natural Gas (LNG), as the near-exclusive strategy (along with completion of the proposed Alaskan pipeline) for meeting incremental requirements for electricity and natural gas; or, alternatively
- A more balanced approach that allows for increased imports of LNG under appropriate circumstances but also:
 - Intensifies efforts to develop domestic natural gas supplies from new fields; and
 - Develops and implements on an urgent, “highest priority possible” basis a major national program to deploy coal gasification and build new Advanced Pulverized Coal plants in order to preserve available supplies of natural gas for higher priority uses.

The choice between these two options is likely to have a major impact on the health of the U.S. economy, the U.S. balance of payments deficit and the number of U.S. jobs for many decades.

As explained this paper explains, the U.S. has an urgent need to increase the energy supplies available to the U.S. market. This need is especially critical during the next 10 to 15 years, when the available supply options are more limited than they may be longer term.

While existing LNG production facilities were built largely to serve only three countries (i.e., Japan, Korea and Taiwan), at least some major new LNG production facilities almost certainly will be completed over the next several years. Further, the U.S. (along with Europe, China and India) is one of the principal markets be targeted by the developers of these projects.

Increased imports of LNG, therefore, undoubtedly can, should and will play an important role in helping to satisfy the urgent need for additional energy supplies in the U.S. market. This potentially can benefit the U.S. when LNG can be obtained: (i) from reliable suppliers; (ii) pursuant to firm, long-term commitments; (iii) at prices that are **not indexed to the price of oil**; (iv) with guaranteed, commercially binding commitment dates for commencing deliveries; **and** (v) **requirements for suppliers to provide substitute sources of supply** whenever supply interruptions occur.

The current, largely unexamined strategy, however, of hoping to be able to satisfy incremental U.S. natural gas and electricity requirements by massively increasing imports of LNG, entails a fundamental shift in U.S. energy strategy, which would require the U.S. to obtain unprecedented amounts of energy from projects that have not yet been built in distant parts of the world that are not under the direct control of American companies.

It is potentially a **very** high risk, high cost strategy – which could seriously jeopardize the long-term health of the U.S. economy.

Many proposed LNG projects may never be completed or may be delayed for many years. Further, competition for available supplies is likely to be intense; in many years buyers from many countries are likely to be competing for supplies that fall far short of global demand.

More often than not, therefore, the U.S. is unlikely to be able to obtain all of the supplies it needs – especially in the time frame it requires. As a result, if it continues to be rely upon a heavily LNG-dependent strategy, the U.S. will be vulnerable to serious energy supply deficits throughout the next 10 to 15 years, with the potential to frequently cause the price of natural gas and electricity to soar and to leave manufacturers without the fuel supplies needed to operate their businesses.

This, in turn, could cause lasting harm to the U.S. economy, seriously impeding economic growth, and potentially costing hundreds of thousands of Americans their jobs. Faced with this scenario, many manufacturers may conclude that, based upon the risk of future shortages and price spikes alone, they have no alternative other than to transfer their manufacturing operations overseas or at least avoid locating new facilities in the U.S.

Further, even if the U.S. ultimately succeeded in obtaining all of the LNG it needs to meet its natural gas and electricity requirements under a heavily LNG-dependent strategy, the potential

adverse impact on the U.S. balance payments deficit could be huge.

The size of this impact will depend in part on the price U.S. purchasers ultimately are required to pay for LNG to compete successfully in a global market – which at this point is unknown.

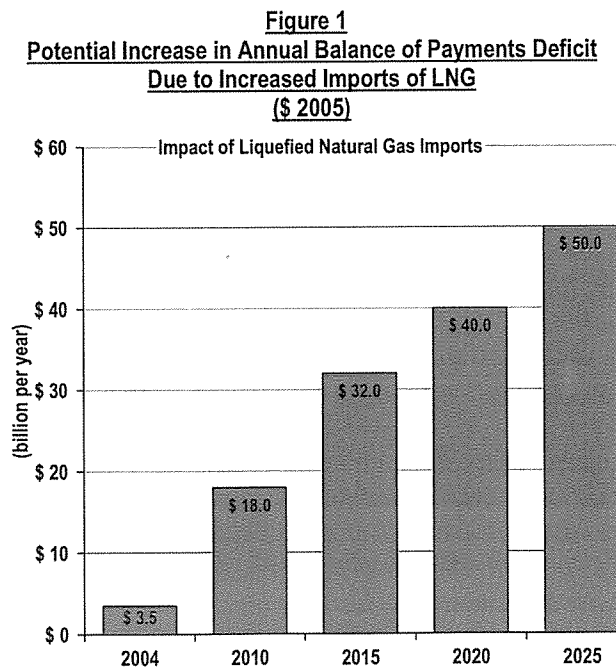
In an increasingly energy-constrained world, however, even when LNG is available, the cost for purchasing LNG is likely to turn out to be far higher than was assumed just two or three years ago when the possibility of increasing imports of LNG was first being seriously considered. Since there are many uses for which LNG is fungible with oil, there also is a significant risk that the pricing of LNG increasingly will be linked to oil – as already has begun to occur in an increasing number of spot market sales over the past year.

Even if the U.S. is able to develop a successful national strategy for reducing dependence upon imported oil, therefore, if we pursue a heavily LNG-dependent strategy for meeting our natural gas and electricity requirements, *and it succeeds*, we are likely to wind up simply substituting another imported fuel for oil that in the long-term may be priced on a similar basis.

The resulting adverse impacts on the U.S. trade deficit could be huge.

If EIA's most recent estimates prove to be accurate, by 2025, in BTU equivalent terms, the amount of LNG imported into the U.S. every year will equal 1.5 X the amount of oil currently imported from the Middle East.

Even at current price levels, over a 20 to 25 year period, this would result in a drain on the U.S. balance of payments that could easily exceed \$ 1 trillion, with the amount spent to import LNG increasing every year:



If price levels for oil and/or LNG continue to escalate sharply, as they have over the past 12 months -- as is certainly a plausible scenario -- the annual cost for LNG imports easily could double or triple; over time, LNG imports could have an adverse impact on the U.S. balance of payments as oil imports have today.

By contrast, if the U.S. pursues the more balanced strategy outlined in this paper, which would provides for some increased use of LNG, but relies far more heavily on domestic energy resources, it is far more certain to be able to obtain the energy supplies required to continue to grow the U.S. economy in a timely and cost effective manner.

As a direct result, hundreds of billions of dollars of energy cost savings are likely to be achieved, compared to the costs of importing LNG. At the same time, the potential loss to hundreds of thousands of U.S. jobs is likely to be avoided (since U.S. manufacturers and farmers will continue to have a chance to compete on a level playing field) and tens of thousands of new U.S. jobs will be created to provide expanded energy supplies using domestic resources.

Tax revenues will be significantly increased, at both the federal and state level. And a huge potential drain on the balance of payments will be avoided, strengthening the U.S. dollar and avoiding potential further on U.S. interest rates.

Organization of Remainder of Paper and Summary of Conclusions

The remainder of this paper will review the major options that are available to meet U.S. needs for electricity and natural gas over the next 10 to 15 years, lessons that can be learned from past mistakes and the potential risks and benefits to the economy from pursuing different strategies.

B. Major Conclusions.

The paper reaches seven major conclusions:

1. To continue to grow the U.S. economy, it is essential to be able to significantly increase supplies of electricity and natural gas.

Natural gas plays a particularly significant role in this process, since it is: (i) one of the primary energy sources used by U.S. manufacturers, who rely heavily upon natural gas both as feedstock and as fuel; (ii) the primary fuel use for residential and commercial space heating; and (iii) currently the primary fuel use by generators to meet incremental demand for electricity in most Regions of the U.S.

To is not possible to sustain U.S. economic growth, therefore, without significantly expanding available supplies of natural gas.

In its most recent annual forecast of U.S. supply and demand, for example, Annual Energy Outlook 2005, EIA concluded that to meet expected growth in demand for electricity, it will be necessary to increase the amount of natural gas used to generate electricity in the U.S. by 3.23 TCf by 2015 (i.e., 8.85 BCf/day) and by 4.32 TCf by 2020 (i.e., 11.85 BCf/day).

These are staggering figures; 4.32 TCf, for example (the projected increase in power sector demand for natural gas in 2020) is slightly more, in BTU equivalent terms, than the total amount of oil that the U.S. currently imports from the Middle East.

Further, in addition to the increased natural gas required to generate electricity, as the number of natural gas-heated homes and office buildings continues to increase, residential and commercial use of natural gas is expected to increase by an additional 1.26 TCf by 2015 and an additional 1.62 TCf by 2020.

Even using EIA's figures, therefore, before allowing for *any* increase in industrial use of natural gas, it is likely to be necessary to increase natural gas supplies by at least 4.59 TCf by 2015 (i.e., more than the equivalent of current oil imports from the Middle East) and by 5.95 TCf by 2020.

Even these figures, however, are based upon a number of assumptions that may prove to be optimistic. EIA's estimate may be closer to a "best case" scenario than to an estimate of the "most likely" amount of natural gas needed to sustain economic growth.

The amount of natural gas required to meet the needs of the U.S. economy during the period between 2005 and 2015 or 2020 could prove to be significantly higher, for example, if: (i) demand for electricity grows more rapidly than EIA projects; (ii) fewer new coal-fired plants are built than EIA currently assumes in its projections; (iii) a larger number of coal-fired plants than expected are retired or converted to natural gas; (iv) nuclear plant performance falls below the near-record levels assumed in EIA's estimates; (v) any significant number of nuclear units is retired; (vi) hydro availability is significantly below normal (particularly in the Pacific Northwest); (vii) production from existing coal-fired units does not increase as sharply as EIA assumes in its estimates (which assume that the output of existing coal-fired plants can be expanded by 7.8 % over the next 4 years alone); (viii) the weather nationally during any winter heating season is significantly colder-than-normal; (ix) temperatures during the summer air conditioning season in any year are hotter-than-normal; and/or (x) there is a significant loss of natural gas production in any year due to Hurricanes in the Gulf of Mexico or any other cause.

One or more of the first seven factors listed could easily increase natural gas requirements in a typical year by as much as 1 to 2.5 TCf per year by 2015 or 2020. Taking into account the potential impact of variations in weather, increases of as much as 3 to 5 TCf per year are entirely possible in some years.

This potentially could increase the amount of natural gas required to meet the needs of the U.S. economy to 6.0 TCf or more by 2015 and to 7.5 TCf or more by 2020.

Further, EIA's estimates of required LNG imports also assume: (i) no significant further declines in total U.S. production; (ii) only a modest decline in imports from Canada any time during the next 15 years; and (iii) a massive increase in the amount of natural gas brought down from Alaska beginning in 2016.

The assumption of only modest declines in imports from Canada is particularly

questionable given: (i) the likelihood of flat or declining Canadian production; (ii) the surge in oil prices this year and the impact this is likely to have on Tar Sands development in Canada (which requires large quantities of natural gas); and (iii) recently announced plans to retire more than 7,000 MW of coal-fired capacity in Ontario, a significant portion of which will be replaced by increased use of natural gas-fired generation in Canada.

If either U.S. production or Canadian imports declines more rapidly than expected, therefore, by 2015 the total U.S. natural gas supply gap could easily be 7.5 to 9.0 TCf, depending upon the extent of the decline.

Further, if this decline continues and the proposed Alaskan pipeline either is delayed significantly (as would not be unusual for a project of this size and complexity, involving coordination between the U.S. and Canadian governments) or never proceeds forward, by 2010 the gap in U.S. natural gas supplies could easily be 10 TCf, if not more.

This begins to approach an almost unfathomable amount – significantly exceeding, for example, 100 % of current natural gas production from the three largest U.S. natural gas producing States (i.e., Texas, Louisiana and Oklahoma), from both on-shore and off-shore wells combined.

It is entirely plausible that the U.S. could face a natural gas supply deficit of this magnitude within the next 12 to 15 years; as discussed at page 49 below, by way of comparison, EIA has already reduced its estimate of expected future natural gas supplies in the lower 48 States by *more* than 10 TCf in a period of just 36 months, between the date it issued its Annual Energy Outlook 2002 and the date it issued its most recent estimate, in Annual Energy Outlook 2005.

Yet, no effort has yet been made to develop a plan to address a potential supply gap of this magnitude.

2. If available supplies of natural gas fall short of required levels, the resulting harm to the economy could be severe.

Over the past 5 years, as a result of the lack of adequate supplies of natural gas to keep pace with U.S. demand, the price of natural gas has more than tripled.

This has already resulted in the cost for natural gas in the U.S. market increasing by approximately \$ 50 to 75 billion per year compared to previously expected levels and has led to tens of billions of dollars of increased costs for electricity, particularly at the wholesale level.

In addition, the lack of adequate supplies of natural gas has forced industrial users to *reduce* consumption of natural gas by almost 750 BCf over the past 4 years (i.e., over 2 BCf/day) – a decline of almost 9.1 %.

These cut-backs in turn have caused a number of major U.S. manufacturing facilities to permanently shut down and caused numerous other facilities to relocate in other countries

or expand manufacturing facilities overseas, costing tens of thousands of Americans their jobs.

These disruptions, however, as painful as they have been, in all likelihood are just the “tip of the iceberg” in terms of the further harm to the U.S. economy that is likely to occur if future supplies of natural gas fall short of the levels required to sustain the growth of the U.S. economy.

To date, the manufacturing facilities that have been forced to shut their doors due to high natural gas prices or lack of adequate supplies or to relocate manufacturing operations overseas typically have been some of the most natural gas intensive processes in the economy – such as fertilizer plants located along the Gulf Coast, aluminum smelters and certain methane producers.

In future years, however, on a weather-adjusted basis, the amount of natural gas required to generate electricity is likely to increase significantly every year, as will the amount of natural gas required to heat homes.

This does not bode well for the U.S. manufacturing sector – which currently still accounts for 1/3rd of total U.S. consumption of natural gas.

This is because, if the increase in available U.S. supplies fails to keep pace with the increase in demand, the only way for generators to keep the lights on and for local gas companies to ensure that homes are properly heated will be for generators and Local Distribution Companies (LDC's) to outbid manufacturers for available supplies of natural gas.

Since many of the most gas-intensive industrial users of natural gas already have been driven out of the U.S. market, however, obtaining the required supplies is likely to be difficult.

To a significantly greater degree than was true just a few years ago, industrial users of natural gas who remain in the market today tend to be “core users,” who value the use of natural gas highly. By definition, these industrial users have not been driven out of the market by the repeated rounds of natural gas price spikes that have occurred in 2000-2001, 2003, last fall and again over the past few months.

Further, many of these users already have made large expenditures on energy efficiency measures to attempt to ensure they are using natural gas as efficiently as possible. While some opportunities for further efficiency improvements still remain, therefore, there are fewer opportunities to reduce natural gas use through conservation in the industrial sector now than there were just two or three years ago, before the price spike that occurred in late February and early March of 2003.

Further, for many remaining industrial users of natural gas, the amount of natural gas used in the manufacturing process (and therefore the cost of natural gas as a percentage of the cost of finished goods) is much smaller than for a fertilizer manufacturer, for example, for

whom the cost of natural gas is the most important input into the total cost of production. As a result, these users may be able to tolerate large increases in the price they pay for natural gas and still make a profit selling finished goods.

As supplies tighten, therefore, in order to free up even relatively small additional amounts of natural gas to generate electricity or heat homes, generators and LDC's may be required to bid up natural gas prices to **very** high levels.

To free up a TCf per year or more supply, even steeper price increases are likely to be necessary.

In the process, large numbers of manufacturing-sector jobs potentially may be lost -- potentially throwing the U.S. economy into a recession and severely exacerbating the already severe imbalance in U.S. trade.

The severity of the price increases that ultimately may be required to balance supply and demand should not be underestimated.

As we've seen during the natural gas price spikes in the winter of 2000-2001 and 2002-2003 and in the crisis in the California electricity crisis in 2000, because energy is an essential commodity, and the markets must clear on a real-time basis, the prices of both electricity and natural gas are extremely sensitive to even small imbalances between supply and demand.

If natural gas supplies in the 2010 to 2015 or 2015 to 2020 time frames consistently fall short of required U.S. supply levels, therefore, it would not be surprising to see natural gas prices increase dramatically from current levels in order for the market to clear (e.g., potentially doubling or tripling again).

This in turn could cause lasting damage to the ability of U.S. companies to compete in global markets.

3. **At this point, however, there is agreement on the part of all observers that the required increases in U.S. supplies of natural gas cannot be obtained from North American sources of supply.**

Indeed, at least prior to the later part of the next decade (when it is possible that the proposed Alaskan pipeline will be completed, potentially bringing in additional natural gas supplies from Alaska), it is not clear that there will be *any* significant net increase in supplies available from North American sources of supply at any time in the foreseeable future. Instead, there is unanimity that, overall, supplies at best are likely to be flat and there may well be a decline -- perhaps even a severe one.

Every observer who has looked carefully at the U.S. market, therefore, now recognizes that, prior to taking into account the potential contribution from LNG or other new sources of supply, ***a supply gap of unprecedented proportions is virtually certain to develop in the U.S. market over the next 10 to 15 years.***

Even using EIA's estimates (we believe underestimate significantly the size of the potential gap), by 2015, this gap is likely to be over 4.5 TCf per year – i.e., comparable in magnitude to all of the oil the U.S. currently imports from the Middle East.

This would be a daunting challenge even if the U.S. natural gas supply gap is limited to a gap of this magnitude.

As discussed previously, however, using more realistic assumptions, there is a likelihood that this gap will be even greater.

The challenge of meeting U.S. needs is likely to become even greater later in the decade – especially if, as is likely to occur even under a “best case” scenario, it is not possible to bring the Alaskan pipeline into service by the 2016 in service date assumed in EIA's most recent long-term projections.

There is an urgent need, therefore, to develop a reliable, cost effective strategy to fill this gap.

4. To date, however, despite the critical importance of providing reliable and affordable energy supplies to the U.S. economy, no Federal or State Agency has made any effort to develop a comprehensive strategy for filling this need. Nor has any apparent effort been made by Congress or any Federal or State Agency to evaluate in a careful, systematic matter: (i) the feasibility, costs, benefits and risks of a strategy of relying on efforts to massively increase imports of LNG as the primary means of filling this gap; or (ii) the costs and benefits of potential alternative strategies, such as the alternative strategy suggested in this paper.

As a result, to a surprising degree, even though the continued health of the U.S. economy is directly at stake, policy-makers are currently being asked to make decisions in a vacuum, without any firm basis for evaluating the feasibility, cost effectiveness or risks of proposed strategies for meeting the future energy needs of the U.S. economy.

5. Largely by default, therefore, the U.S. is rapidly becoming locked into a potentially high risk strategy of hoping to be able to massively increase imports of LNG as its near-exclusive strategy for meeting its incremental natural gas and electricity requirements for much of the next decade.

This shift to a heavily LNG-dependent strategy has occurred only recently; just 3 years ago, the Department of Energy (DOE) concluded that increased imports of LNG were not likely to play a significant role in meeting future energy needs.

Further, no federal or state Agency has yet undertaken a comprehensive evaluation of the feasibility or potential costs or risks of a strategy that depends upon being able to import massive amounts of LNG into the U.S. – even though virtually all of the increased LNG the U.S. hopes to be able to import in future years is expected to come from new projects in other countries that have not yet been built and in all by a handful of cases have not even broken ground.

Many of the potential costs and risks associated with a heavily LNG-dependent strategy, however, are readily apparent. These include:

i. Major uncertainties regarding project completion.

While the focus of much of the discussion in the U.S. to date regarding LNG has tended to be on siting of new LNG terminals in the U.S., construction of new terminals is not necessarily the only or even the most important obstacle to obtaining required levels of supply.

Instead, there is a high risk, both in the immediate future and longer term that the required level of LNG supplies will not be available in a timely manner – or potentially not at all.

Very little consideration appears to have been given, however, to the potential adverse impacts that even a 1 or 2 year delay in completion of one or more major new LNG supply projects could have on the U.S. economy – even though the consequences potentially could be devastating, given the potential impact on the U.S. natural gas and electricity markets of even a modest shortfall in supply.

(Last year, for example, the temporary loss of 2.25 BCf/day of supply due to damage to facilities in the Gulf of Mexico caused by Hurricane Ivan caused the price of natural gas futures traded on NYMEX to increase by almost 50 % in a relatively short period, even though most of the lost production was restored in just a few weeks. Several proposed LNG projects, however, are *each* expected to produce approximately the same amount of natural gas. If completion of any one of these projects is delayed for an extended period, however – which is hardly a rare occurrence for a major, complex, multi-year, multi-billion dollar project, key portions of which may be built at a remote site – or the project is cancelled, the adverse impact on the U.S. natural gas and electricity markets presumably could be several times greater than the increased costs that resulted from Hurricane Ivan.)

ii. Near-term (i.e., over the next 3 to 7 years) there is a high risk that a number of critically important LNG supply projects will not be able to commence delivery by the dates the required supply is needed in the U.S. market.

Near-term (i.e., over the next 3 to 7 years), virtually all of the existing LNG production capability is committed to other countries.

To obtain the supplies the U.S. needs, therefore, we must rely on the timely completion of massive new multi-billion dollar liquefaction and production facilities in other countries.

Many of these projects have not yet broken ground and could be delayed for several years; others may never be built.

Notably, only a small fraction of the increase in U.S. imports required to meet U.S. needs already is “locked in” under commercially binding agreements with firm commitment dates enforceable by meaningful penalties. Most projects still are at an earlier stage of planning and development.

Further, the Department of Energy does not appear to have any program in place to attempt to accelerate the completion of these projects or even closely monitor their progress.

Even modest delays in the completion of a small number of these projects, however, potentially could leave **huge** gaps in the expected sources of U.S. energy supply over the next 3 to 7 years.

Even though the risk of a major shortfall in supplies is very high, however, ***the U.S. currently has no fallback strategy to fill this potential gap in its energy needs.***

This in turn could have a crippling effect on the U.S. economy, starting as soon as 2008.

iii. Longer-term (i.e., for present purposes, during the period from 2012 to 2020), it is no longer clear that a 2nd round of new LNG projects will be initiated within the time frame needed to meet U.S. needs. The U.S. currently has no strategy to deal with this possibility, however, even though, given the lead times involved to develop alternative sources of supply, steps to develop alternatives need to be initiated now.

EIA's projections of expected sources of future U.S. energy supplies assume that major LNG producers such as Qatar will: (i) undertake in the immediate future and complete promptly a 1st round of major new projects; and then (ii) proceed to initiate immediately a 2nd major round of projects, in order to meet the expected natural gas supply needs of the U.S. and other countries in the next decade.

There is increasing uncertainty, however, as to when a potential 2nd round of major new LNG projects might be initiated or whether the next round of projects needed to meet rapidly expanding global demand during the next decade will even be built during the next decade.

Qatar, for example – the country expected to become the world's largest producer – recently announced a moratorium of indefinite duration on any new LNG projects. It is unclear whether this moratorium will be lifted any time in the next several years.

While Qatar and at least some other countries appear to have adequate reserves to initiate additional projects, these countries may choose to husband their resources them on a measured basis – potentially over a period of several decades. The Qataris, for example, recently have suggested a 100-year time frame for development. Indeed, it is not clear why Qatar would see it as being in that country's best interests to develop these resources on a more aggressive scale.

Further, given developments over the past 24 months in the global oil market, there is a substantial possibility – perhaps even a high likelihood – that if and when a 2nd round of major new natural gas development projects is initiated in Qatar or other countries with stranded gas reserves, priority will be given to Gas-to-Liquids (G-T-L) projects that produce diesel fuel for use in hybrid diesel engines and trucks in lieu of new LNG development projects.

As a result, it is possible that no new LNG projects will be built for many years.

This is not an academic issue. Currently, this expected 2nd round of projects is the primary assumed source of natural gas supply for the U.S. market for the period between 2012 and 2020.

If these projects are not built or even significantly delayed, and no alternative source of supply is developed, there may be no fuel available to meet the incremental natural gas and electricity requirements of the U.S. economy during the period between 2012 and 2020.

Potentially just as troubling, in the short time since Mahmoud Ahmadianejad was elected President of Iran, prominent Iranian officials already have begun calling for Iran (which previously had been expected by many to become the 2nd largest supplier of LNG to other countries) to discontinue its plans to export natural gas and to use its gas reserves instead for internal purposes. (Specifically, the proposal that has been made is to use Iran's natural gas reserves primarily to: (i) enhance oil field recovery in Iran (which in recent years has been declining); and (ii) build petrochemical facilities that would create new jobs and help stimulate economic growth in Iran (a major issue that led to President-elect Ahmadianejad election).)

While the U.S. has no plans to purchase LNG from Iran, until the recent election, exports of natural gas from Iran, both by pipeline and in the form of LNG, had been expected to play a major role in meeting the huge increase in demand for natural gas that is expected to occur over the next decade in Europe and Asia. (Iran, along with Qatar and Russia, is one of the three countries believed to have by far the largest natural gas reserves in the world, and is strategically located to export natural gas, both by pipeline and as LNG.)

If Iran decides instead to restrict its exports of natural gas – either now or at any point in the future – the effect will be to leave a huge void in the global market for natural gas.

In an integrated global market, this would be likely to have a major impact on the price of LNG for all purchasers, regardless of where they obtain their supplies – including the U.S.

If the U.S. follows a heavily LNG-dependent strategy for meeting its natural gas supplies, therefore, changes in Iranian policy or control over Iranian natural gas assets, either now or at any point over the next 10 to 15 years, could have profound impacts on the price and availability of natural gas and electricity in the U.S.

iv. Competition for available supplies with other countries is likely to be intense, further limiting supplies available to the U.S. market.

Further, even if a large number of major LNG projects ultimately are built (which remains to be seen), if and when these projects are completed, many other countries from almost every Region of the world (including China, Japan, Korea, India, Great Britain, France and Spain) are likely to be competing for the output from these projects. As a result, the available supply may only be sufficient to meet a small fraction of total global demand.

Even under a “best case” scenario, therefore, the U.S. is only likely to be able to satisfy a relatively small portion of its expected natural gas supply needs over the next decade from the global LNG market – and even then potentially at a very high price.

The U.S. currently has no strategy for dealing with these possibilities, however, even though the lead time for completing projects that could provide an alternative source of supply in a timely manner in such that they should be initiated at once.

v. While LNG initially was held out as a potential low cost source of supply that would help to constrain natural gas prices in the U.S., in the current, supply-constrained global energy market, there is little reason to remain confident that it will play that role.

Instead, future LNG pricing is uncertain at best.

In a global market in which supplies of oil are far tighter than was expected just two years ago, LNG pricing already increasingly is being linked to the price of oil.

In part as a direct result, in February, March and April of this year, LNG imports into the U.S. declined more than 20 % from peak levels reached in December. This decline occurred because buyers from other countries were willing to outbid U.S. customers for available supplies of LNG, paying prices more closely tied to the price of oil.

This could prove to be an early warning sign of a continuing trend.

Two years ago, very few experts were predicting significant increases in the price of oil on the global market; indeed, even at the beginning of this year, many experts were predicting that oil prices would decline in 2005.

It has now become apparent, however, that as global energy demand continues to grow more rapidly than had previously been expected, in more years than not, global supplies of *both* LNG and oil are likely to fall far below required levels for much of the next decade.

If this should occur, and the U.S. continues to leave itself dependent upon a strategy of being able to massively increase imports of LNG as its near-exclusive means of meeting its incremental requirements for natural gas and electricity, the U.S. – as the largest consumer of *both* oil *and* natural gas worldwide – is likely to find that that it is required to pay a sharply escalating premium to meet its energy requirements *every* year for much of the next decade, even if it succeeds in reducing its dependence upon imported oil.

This in turn could have a devastating impact on the U.S. economy, from which it might be difficult for the U.S. economy to recover.

vi. A heavily-LNG dependent strategy also potentially increases the vulnerability of the U.S. natural gas and electricity markets to extreme price volatility that potentially can have a crippling effect on U.S. businesses and consumers.

By definition, LNG projects are designed to permit suppliers to be able to ship supplies to

any delivery point in the world in which there is an LNG delivery terminal and a re-vaporization facility.

Even if new LNG supply projects are built, therefore, any LNG supplies that are not tied down under long term contracts presumably can and will be shipped to whatever country in the world is willing to pay the highest price, with the flow of LNG on the global market potentially changing frequently from year-to-year or even month-to-month.

During certain periods, this may benefit U.S. customers, by increasing supplies potentially available to the U.S. market.

It also is virtually guaranteed, however, to create the potential for unprecedented price volatility in the U.S. natural gas and electricity markets.

This is because, to the extent the U.S. relies upon purchases of LNG to meet a significant portion of its future energy requirements, it will potentially become vulnerable – in a way that has never occurred previously – to suddenly losing a significant portion of its natural gas supply, at any point in time that China or Japan or Spain or any other country in the world chooses to outbid U.S. purchasers for available supplies that are not tied up under long-term contracts. (In future years, the percentage of total LNG supplies that is not tied up under long-term contracts is expected to potentially triple.)

This in turn will create the potential for unprecedented price spikes in both the natural gas and electricity markets in the U.S., since the U.S. potentially will be at risk at any point of potentially losing up to several Bcf per day of its natural gas supply (or, alternatively, being required to outbid literally every other potential purchaser in the world to retain that supply).

In markets for natural gas and electricity in which the marginal source of supply sets the market clearing price for all purchasers not bound by fixed-price contracts, compared to the alternative suggested in this paper of developing alternative, domestic sources of supply, this could lead to tens of billions of dollars per year in increased costs, not just for purchasers of LNG, but for every end user or wholesale purchaser in the natural gas and electricity markets required to pay the spot market price.

We saw last fall just how severe that volatility can be, when damage to facilities in the Gulf of Mexico caused the temporary loss of 2.25 Bcf/day of natural gas supply.

Much of this supply returned to service in a relatively short period; even the temporary loss of supplies of the magnitude, however, was sufficient to cause the price of natural gas futures traded on NYMEX to suddenly jump by almost 50 % -- leading to billions of dollars of increased costs for end users of natural gas.

If the U.S. continues to pursue a heavily LNG-dependent strategy, however, by 5 to 7 years from now, swings of this magnitude (which is about the same as the output from a single large LNG project) could become routine.

At the same time, a heavily LNG-dependent strategy also potentially will give tremendous pricing power to a small number of large LNG suppliers, each of whom potentially could become a "pivotal" supplier, in a position to increase prices in the U.S. market by withholding shipments that ordinarily might have been expected to be sent to the U.S. and directing them instead to other parts of the world.

vii. A heavily LNG-dependent strategy virtually guarantees that U.S. manufacturers and farmers will be at a competitive disadvantage in attempting to compete in global markets.

Since the shipping costs required to deliver LNG into the U.S. market from almost every producer other than Trinidad generally are higher than for any other market, even if a heavily LNG-dependent strategy for meeting future U.S. natural gas and electricity needs ultimately succeeds in obtaining targeted levels of supplies, depending upon LNG to meet incremental U.S. natural gas requirements virtually guarantees that U.S. businesses and farmers will be at a competitive disadvantage, since they inevitably will be required to pay a higher price for natural gas supplies (or, in the case of farmers, for fertilizer derived from natural gas) than competitors anywhere else in the world.

viii. Finally, even if a heavily LNG-dependent strategy is successful in obtaining targeted levels of supply, it will massively increase U.S. dependence upon imported fuels and have a major adverse impact on the U.S. balance of payments deficit.

This in turn inevitably will lead to a huge further drain on the U.S. balance of payments deficit, at a time when there is critical need to reduce the U.S. balance of payments deficit.

It also inevitably would create a further strain on the value of the dollar at a time when the U.S. can ill afford such a burden, potentially forcing the U.S. to borrow \$ 1 trillion or more over a 20 year period to pay for a new source of imported fuel.

While increased imports of LNG undoubtedly have a significant role to play in meeting future U.S. energy needs, therefore, a heavily LNG-dependent strategy carries with it huge risks and potentially very high costs.

These potential costs and risks are not yet well understood largely because so little effort has been made to evaluate the potential costs and risks associated with a relying upon a heavily LNG-dependent strategy as the principal means of meeting incremental U.S. natural gas and electricity requirements over the next 10 to 15 years.

To a much greater degree than is currently recognized, however, the strength and prosperity of the U.S. economy over much of the next 10 to 15 years hangs in the balance.

By creating a high risk of periodic shortages in natural gas and electricity supplies and virtually guaranteeing very high prices, a heavily LNG-dependent strategy almost certainly will slow down economic growth in the U.S. significantly over the

next decade and potentially could bring economic growth to a complete halt.

In all likelihood, hundreds of thousands of U.S. jobs will be lost – quite needlessly – and the ability of U.S. manufacturers and farmers to compete in the global market potentially weakened for decades to come.

It would be irresponsible, therefore, to take action that locks the U.S. into pursuing such a strategy without more carefully evaluating the costs and risks and exploring the feasibility and potential benefits of alternative strategies for meeting incremental U.S. energy needs over the next 10 to 15 years.

These alternatives include renewable energy, nuclear power and intensified efforts to expand use of domestic fuels. Each of these alternatives is discussed further below.

6. While nuclear power and renewable energy may have an important role to play in meeting this country's long-term energy needs, the near-term contribution they can make is more limited.

Powerful arguments can be made, for example, regarding the potential importance of reviving the nuclear option in the U.S.

These arguments certainly deserve to be considered seriously.

It is important to recognize, however, that even if a firm commitment were to be made tomorrow to seek permission to build one or more new plants and proceed to construct such a plant once the necessary approvals were granted, the sponsors of the projects currently being considered do not expect to be able to complete construction of the first plant(s) for which approval might be granted until, at the earliest, 2015 or 2016.

Further, while applications for preliminary design approvals have been filed for several projects, none of the consortia sponsoring these applications has yet made a decision to seek approval to build a new plant. Nor is it clear that any such approval will be sought any time this year.

Even if the necessary permit applications were to be filed immediately, there also is a significant possibility that the permit applications will take longer than expected to resolve and/or that they will subsequently be held up by the courts.

Even under a "best case" scenario, therefore, it is not clear that the first "next generation" nuclear plant can be completed any earlier than 2018 or 2019.

Further, even if one or two new plants go into service by that date, this will just start the process of reviving the nuclear option in the U.S.

More time undoubtedly will be required before a large enough number of plants can be completed to significantly affect the total amount of nuclear capacity available on a nation-wide basis.

Further, by that time, an increasing number of nuclear plants will be more than 50 years old; while the license life of many has recently been extended to 60 years, the history to date is that many nuclear plants in the U.S. have needed to be retired well before their initial licenses have expired. We do not yet have any experience in the U.S. operating large nuclear plants for more than 40 years.

Even if a larger number of new plants starts to come on line soon after 2020, therefore, many of these plants may be needed to replace existing nuclear units that are about to be retired. As a result, they may not contribute to serving new load or reducing dependence upon gas-fired generation.

None of this is a reason to turn away from the nuclear option; indeed, the need that is likely to arise over time to begin replacing existing nuclear plants and the lead time required to do so increases the urgency of making a firm decision regarding this country's policy regarding nuclear energy at the earliest possible date.

Realistically, however, no matter how critical the need may be to consider reviving the nuclear option, construction of new nuclear plants is not likely to make any significant contribution to meeting our country's **incremental** energy needs between now and 2020, and perhaps even between now and 2025. Instead, at least within the period between now and 2025, it may be critical simply to ensure that the U.S. is able to continue to rely upon nuclear power for the 20 % of electric energy that it *currently* obtains from nuclear plants. Aggressive development of renewable energy may hold greater promise as a means of helping to meet our incremental energy needs during the next decade.

Here too, however, there are practical limits on how rapidly new capacity can be added, especially near term.

EIA's most recent projections, for example, call for an increase in total increase in megawatt hours generated from renewable energy sources between 2005 and 2020 of only 56.9 Gigawatt hours.

This represents a major increase from current levels, but still is sufficient only to cover 4.7 % of expected growth in electricity demand during this period.

Enactment of some of the measures currently being considered in Conference might result in some increase in the penetration rate for renewable resources, especially by the mid to later part of the next decade.

The modeling conducted to date by EIA (principally in connection with the recommendations of the National Commission on Energy Policy), however, suggests that the impact, if any, on required levels of natural gas consumption is likely to be modest until, at the earliest, late in the next decade.

To more significantly reduce dependence upon LNG over the next 10 to 15 years, therefore, requires turning to other sources of supply.